

WHAT IS CLAIMED IS:

1. A grease composition for lubricating a rock bit for drilling subterranean formations or for lubricating a high temperature bearing, the grease comprising:

a high viscosity index polyalphaolefin base fluid, wherein the polyalphaolefin contains an average of 30 to 100 carbon atoms, a branching ratio of less than about 0.19, and an average side chain length of 8 or more carbon atoms, wherein the high viscosity index polyalphaolefin base fluid comprises from about 15 wt. % to about 85 wt. % of the grease composition;

an additional base fluid selected from the group consisting of monosubstituted alkyl naphthalenes, polysubstituted alkyl naphthalenes, and mixtures thereof, wherein the alkyl comprises from about 16 to about 30 carbon atoms, wherein the additional base fluid comprises from about 15 wt. % to about 85 wt. % of the grease composition;

an ester base fluid, the ester comprising from about 5 to about 20 carbon atoms, wherein the ester base fluid comprises from about 0.5 wt. % to about 5 wt. % of the grease composition;

a metal complex soap, the soap comprising a residue of one or more fatty acids comprising from 2 to 22 carbon atoms, wherein the metal is selected from the group consisting of calcium, lithium, sodium, barium, titanium, and mixtures thereof, wherein the metal soap comprises from about 5 wt. % to about 45 wt. % of the grease composition;

an antioxidant, wherein the antioxidant comprises from about 0.2 wt. % to about 2 wt. % of the grease composition;

a metal deactivator, wherein the metal deactivator comprises from about 0.1 wt. % to about 1.5 wt. % of the grease composition;

an antiwear agent, wherein the antiwear agent comprises from about 0.1 wt. % to about 15 wt. % of the grease composition; and

a bismuth oxide extreme pressure additive, wherein the bismuth oxide extreme pressure additive comprises from about 1 wt. % to about 20 wt. % of the grease composition.

2. A grease composition for lubricating a rock bit for drilling subterranean formations or for lubricating a high temperature bearing, the grease comprising a high viscosity index polyalphaolefin, wherein the high viscosity index polyalphaolefin has an average side chain length of 8 or more carbon atoms.

3. A grease composition for lubricating a rock bit for drilling subterranean formations or for lubricating a high temperature bearing, the grease comprising a high viscosity index polyalphaolefin, wherein the high viscosity index polyalphaolefin has a branching ratio of less than about 0.19.

4. The grease composition of claim 3, wherein a number average molecular weight Mn of the high viscosity index polyalphaolefin is from about 3400 to about 22000.

5. The grease composition of claim 3, wherein the grease comprises from about 20 wt. % to about 50 wt. % of the high viscosity index polyalphaolefin.

6. The grease composition of claim 3, further comprising a naphthalene substituted by an alkyl group.

7. The grease composition of claim 3, further comprising a naphthalene substituted by a single alkyl group.

8. The grease composition of claim 6, wherein the alkyl group comprises from about 16 to about 30 carbon atoms.

9. The grease composition of claim 6, wherein the grease comprises from about 30 wt. % to about 80 wt. % of the naphthalene substituted by an alkyl group.

10. The grease composition of claim 3, further comprising an ester base fluid.

11. The grease composition of claim 10, wherein the ester comprises from about 5 to about 20 carbon atoms.

12. The grease composition of claim 10, wherein the grease comprises from about 0.5 wt. % to about 5 wt. % of the ester base fluid.

13. The grease composition of claim 3, further comprising a metal complex soap.

14. The grease composition of claim 13, wherein the metal complex soap is derived from a fatty acid comprising from about 2 to about 22 carbon atoms.

15. The grease composition of claim 13, wherein the grease comprises from about 5 wt. % to about 45 wt. % of the metal complex soap.

16. The grease composition of claim 13, wherein the metal is selected from the group consisting of alkaline earth metals, alkali metals, Group IIB metals, Group IIIA metals, Group IVA metals, Group VA metals, Group IVB metals, Group VB metals, and mixtures thereof.

17. The grease composition of claim 13, wherein the metal is selected from the group consisting of lithium, sodium, potassium, magnesium, strontium, barium, aluminum, titanium, bismuth, and mixtures thereof.

18. The grease composition of claim 16, wherein the metal comprises calcium.

19. The grease composition of claim 16, wherein the metal comprises a compound selected from the group consisting of metal hydroxides, metal oxides, metal isopropoxides, and mixtures thereof.

20. The grease composition of claim 3, wherein the grease comprises a non-soap thickener.

21. The grease composition of claim 20, wherein the non-soap thickener selected from the group consisting of a polyurea thickener, a silica gellant, a polytetrafluoroethylene, a clay, and mixtures thereof.

22. The grease composition of claim 20, wherein the grease comprises from about 3 wt. % to about 40 wt. % non-soap thickener.

23. The grease composition of claim 3, further comprising from about 0.2 wt. % to about 2 wt. % of an antioxidant.

24. The grease composition of claim 3, further comprising from about 0.2 wt. % to about 2 wt. % of a phenolic antioxidant.

25. The grease composition of claim 3, further comprising from about 0.2 wt. % to about 2 wt. % of an amine antioxidant.

26. The grease composition of claim 3, further comprising from about 0.02 wt. % to about 1.5 wt. % of a metal deactivator selected from the group consisting of substituted benzotriazole, derivatives of substituted benzotriazole, and mixtures thereof.

27. The grease composition of claim 26, wherein the metal deactivator consists essentially of benzotriazole.

28. The grease composition of claim 26, wherein the grease comprises from about 0.02 wt. % to about 1.5 wt. % benzotriazole.

29. The grease composition of claim 3, further comprising from about 0.1 wt. % to about 8 wt. % of a polytetrafluoroethylene antiwear agent.

30. The grease composition of claim 3, further comprising from about 2 wt. % to about 25 wt. % of a molybdenum disulfide extreme pressure additive.

31. The grease composition of claim 3, further comprising from about 1 wt. % to about 20 wt. % of a bismuth oxide extreme pressure additive.

32. The grease composition of claim 3, further comprising from about 1 wt. % to about 30 wt. % of an extreme pressure additive.

33. The grease composition of claim 3, further comprising an anti-seize agent.

34. The grease composition of claim 33, wherein the anti-seize agent comprises copper powder.

35. The grease composition of claim 33, wherein the grease comprises from about 3 wt. % to about 9 wt. % of the anti-seize agent.

36. A grease composition for lubricating a rock bit for drilling subterranean formations or for lubricating a high temperature bearing, the grease comprising:

a base fluid, the base fluid consisting essentially of an ester base fluid, wherein the ester base fluid comprises an ester selected from the group consisting of pentaerythritol ester, dipentaerythritol ester, trimellitate ester, and mixtures thereof; and

from about 10 wt. % to 45 wt. % of a calcium complex soap, the soap comprising a residue of one or more fatty acids comprising from about 2 to about 22 carbon atom.

37. A rock bit for drilling subterranean formations, the rock bit comprising:

a bit body, the bit body comprising a plurality of journal pins each comprising a bearing surface;

a cutter cone mounted on each journal pin with a journal bearing surface; and

a grease stored in a pressure-compensated reservoir in contact with the journal bearing surface, the grease comprising a high viscosity index polyalphaolefin, wherein the polyalphaolefin has a branching ratio of less than about 0.19.

38. A method for lubricating a rock bit for drilling subterranean formations, the rock bit comprising a body and a plurality of cutter cones mounted, the cutter cones mounted on the body, the rock bit comprising a journal bearing in contact with a grease reservoir, the method comprising:

evacuating a portion of the rock bit comprising the journal bearing; and

introducing a grease into the evacuated area, the grease comprising a high viscosity index polyalphaolefin, wherein the polyalphaolefin has an average side chain length of 8 or more carbon atoms.

39. A method for lubricating a rock bit for drilling subterranean formations, the rock bit comprising a body and a plurality of cutter cones mounted, the cutter cones mounted on the body, the rock bit comprising a journal bearing in contact with a grease reservoir, the method comprising:

evacuating a portion of the rock bit comprising the journal bearing; and

introducing a grease into the evacuated area, the grease comprising a high viscosity index polyalphaolefin, wherein the polyalphaolefin has a branching ratio of less than about 0.19.